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BEFORE THE STATE OF WASHINGTON  
ENERGY FACILITY SITE EVALUATION COUNCIL

IN RE APPLICATION NO. 2002-01

**EXHIBIT 24.0** (DMH-T)

BP WEST COAST PRODUCTS, LLC

BP CHERRY POINT COGENERATION  
PROJECT

**APPLICANT'S PREFILED DIRECT TESTIMONY**

**DAVID M. HESSLER, P.E.**

**Q. Please introduce yourself to the Council.**

A. My name is David Hessler, and my business address is 7521 Virginia Oaks Drive,  
Suite 240, Gainesville, Virginia 20155.

1 **Q. What is the subject of your testimony?**

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3  
4 A. My testimony will address two topics. First, my background and experience related  
5 to noise control for power plants and, second, the sound emissions associated with the  
6 proposed BP Cherry Point Cogeneration facility.  
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11 **Background**  
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13 **Q. What is your occupation and title?**

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15 A. I am a principal consultant with Hessler Associates, Inc., an acoustical engineering  
16 consulting firm founded in 1976. To an almost exclusive degree, the specialty of the  
17 firm has always been the acoustical design of power plants for the electric power  
18 generation industry. All of the four engineers on staff have extensive backgrounds in  
19 power plant noise control in general and combustion turbine noise control in  
20 particular.  
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29 **Q. Please describe your background/education and experience.**

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31 A. I have a Bachelor of Science degree in Mechanical Engineering from the University  
32 of Maryland and am a certified Professional Engineer in the Commonwealth of  
33 Virginia. I have been directly involved in the acoustical design and field testing of  
34 power plants on essentially a daily basis for the last twelve years and have been the  
35 principal and usually sole acoustical designer of several hundred power stations  
36 worldwide - most of which have been combined cycle facilities similar to the present  
37 project. My work scope on a typical project consists of noise monitoring prior to  
38 construction to establish pre-existing environmental conditions, the computer  
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1 modeling of the planned facility to assess potential noise impacts, the design or  
2 specification of all noise controls, and the testing of the completed facility.  
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6 **Q. What is your role in connection with the BP Cherry Point Cogeneration project?**  
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8 **A.** I was retained to evaluate the noise implications of the project, recommend any  
9 appropriate noise mitigation measures, and respond to questions about noise issues.  
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14 **Noise Analysis**  
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16 **Q. Please describe your noise analyses for the project's Application.**  
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18 **A.** I was asked to review the current plant configuration, which had been revised from an  
19 earlier design, with respect to potential environmental noise impacts and recommend  
20 any appropriate actions that might be prudent to ensure that the project will comply  
21 all regulatory noise limits. I was provided with the latest site plans, § 3.9 and  
22 Appendix K of the original Application for Site Certification.  
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28 With the changed equipment layout, particularly the change from air to water cooling,  
29 my recommendations were to carry out some additional background measurements to  
30 get an up-to-date and longer duration picture of existing background sound levels at  
31 the nearest sensitive receptors and to independently remodel the future noise  
32 emissions of the plant based on the revised site layout.  
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41 As a result of these recommendations a new background sound level monitoring  
42 survey was carried out from April 8 to the April 11, 2003 and a new noise model of  
43 the facility was developed. The complete methodology and results of this field study  
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1 and the related plant noise modeling are outlined in Exhibit 24.1 (DMH-1), Technical  
2 Memorandum 1671-032803-C (Apr. 16, 2003), which was provided in the  
3 Application Revisions (Appendix K) submitted in April 2003.  
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7  
8 To briefly summarize the study, background noise measurements were made on a  
9 continuous basis over a 60 hour period at the four positions shown in Exhibit 24.2  
10 (DMH-2) representing the nearest potentially sensitive noise receptors to the project  
11 site. By "potentially sensitive receptor," I mean locations such as residences, schools,  
12 churches, etc., where any significant increase in environmental noise would probably  
13 be unwelcome.  
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22 The average L90 statistical sound level over the entire survey period at each location  
23 was reported as a conservative single-number representation of the pre-existing  
24 environmental sound level. The L90 level is the sound level that is exceeded during  
25 90% of the measurement interval. As such, this statistical descriptor literally captures  
26 the background sound level that exists during the quiet lulls between sporadic noise  
27 events like cars passing by or dogs barking. This conservative level quantifies the  
28 environmental sound level that is consistently present and available to obscure or  
29 mask noise from a new source, such as a power station. It is the extent to which a  
30 new source exceeds this pre-existing base sound level that determines its  
31 perceptibility or non-perceptibility in the community.  
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44 Computer modeling was used to predict what the plant noise level would be at the  
45 nearest sensitive receptors during full load operation for comparison to the  
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1 background levels measured during the field survey. As described in Exhibit 24.1  
2 (DMH-1), it is important to note that the inputs to the noise model; i.e. the sound  
3 levels of all pieces of plant equipment, were derived entirely from field measurements  
4 I personally took of similar or identical equipment in actual operation. Such a  
5 database can only be developed from measuring many combined cycle power  
6 facilities over many years and I believe our power industry equipment sound power  
7 level library is the most extensive in the world.  
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17 **Q. Have you performed any other monitoring or modeling with respect to the**  
18 **project? If so, please describe and explain why this additional work was done.**  
19

20 **A.** Yes, another ambient sound level survey, using the same methodology as the April  
21 survey, was carried out in July 2003 at four additional receptor locations selected by  
22 Whatcom County in response to County concerns about potential noise from the  
23 facility.  
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31 In general, the new measurement locations, illustrated in Exhibit 24.3 (DMH-3), were  
32 considerably further from the project site than the April positions and were largely  
33 intended as documentation of existing conditions for possible comparison to future  
34 levels after the project is operational. A brief description of this second survey,  
35 including the level vs. time plots, is attached as Exhibit 24.4 (DMH-4), Technical  
36 Memorandum 1671-080603-A (Sept. 12, 2003). The measurement positions were  
37 determined at a meeting with David Grant, Sharon Roy and Jim Thompson of  
38 Whatcom County on July 8, 2003, during which the previous monitoring and noise  
39 modeling work was discussed.  
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3 The measurements at the Alderson Road position were actually taken by Jim  
4 Thompson, the County noise engineer, using County equipment. Note that one  
5 additional measurement location on Comox Road in Birch Bay Village is also shown  
6 in Exhibit 24.3 (DMH-3). This position was monitored as a part of the April survey  
7 and is shown for convenience on the larger area photomap.  
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15 **Sound Emissions**  
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17 **Q. Please explain what regulations apply to sound emissions from a facility such as**  
18 **the BP Cogeneration project.**  
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21 A. Sound emissions are regulated at both the state and local level. In this case,  
22 Whatcom County has adopted an environmental noise ordinance that applies  
23 essentially the same criteria as the Washington State regulation. The Washington  
24 State Department of Ecology regulations (WAC 173-60) establish limits on the levels  
25 and duration of noise crossing property boundaries. Allowable maximum sound  
26 levels depend on the zoning of the source of the noise, in this case “heavy impact  
27 industrial”, and the zoning of the receiving property. Except for short-term  
28 exceedances prescribed in State and local law, the project may not generate sound  
29 levels greater than 70 dBA at adjacent industrial properties. At the nearest residential  
30 properties, noise from the project may not be greater than 60 dBA during the day and  
31 50 dBA at night (10 p.m. to 7 a.m.).  
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45 **Q. Based on your experience and analyses, will the current BP proposal comply**  
46 **with these noise regulations?**  
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1 A. The results of my plant noise modeling analysis clearly indicate that during steady  
2 state operation noise from the facility will not exceed the most stringent 50 dBA  
3  
4 nighttime limit at the nearest residences or at any other point further from the plant,  
5  
6 such as in the community of Birch Bay. At the nearest residential receptor on  
7  
8 Kickerville Road east of the site, identified as Position 14 in Exhibit 24.2 (DMH-2),  
9  
10 plant noise is expected to be at least 7 dBA under the 50 dBA limit. At all other  
11  
12 receptor points, whether residential or industrial in nature, plant noise will typically  
13  
14 be 10 dBA or more below the applicable regulatory limits during normal operation.  
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18 In addition to steady state noise, plants of this type generally produce temporarily  
19  
20 higher noise levels while they are being restarted after a shutdown. During this start  
21  
22 up period, which may last a few hours, a number of steam vents and other noise  
23  
24 sources that are not otherwise in service become active. Although such starts will be  
25  
26 fairly infrequent at this plant, appropriate noise control measures will be implemented  
27  
28 so that transient noise from these sources remains reasonably close to steady state  
29  
30 noise levels and does not exceed the regulatory noise limits. The specific mitigation  
31  
32 measures needed to accomplish this will be developed as the plant design progresses  
33  
34 in detail; however, some of the typical features that might be incorporated pending  
35  
36 the outcome of future analyses include: steam vent silencers (on the main HRSG  
37  
38 start-up steam vents, blowdown tank vents, and drains) and acoustical grade  
39  
40 pipe/tank/valve lagging. Enclosure of the steam turbine bypass valves, condenser and  
41  
42 vacuum pumps, other potential sources of transient noise, is already planned.  
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1 **Q. Was determining compliance with the State and local regulations the sole goal of**  
2  
3 **your analysis?**

4  
5 A. No. Beyond compliance with the absolute State and local noise limits, the ultimate  
6  
7 objective of the acoustical design is to make plant noise largely imperceptible, if not  
8  
9 completely inaudible, during steady state operation. In quantitative terms, that means  
10  
11 limiting plant noise emissions so that the total sound level (background plus plant) at  
12  
13 any given sensitive receptor is not increased by more than 5 dBA beyond the pre-  
14  
15 existing level. Such an increase is commonly described as being barely perceptible  
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17 with careful listening and; consequently, establishes a kind of threshold above which  
18  
19 plant noise may begin to become noticeable to the surrounding community and below  
20  
21 which plant noise would be somewhat or completely imperceptible.

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25 The background sound level surveys were carried out specifically to determine what  
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27 the pre-existing levels are at key receptor points in order to establish design targets  
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29 for plant noise that would limit any cumulative increase in sound level to 5 dBA or  
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31 less. Moreover, the L90 statistical level, mentioned earlier, was taken as the design  
32  
33 datum for background noise at each receptor point to be conservative.

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37 **Q. Again based on your experience and analyses, will the BP project cause a**  
38  
39 **perceptible increase in noise to the community during normal operation?**

40  
41 A. No. The current plant design is expected to generate noise levels at all potentially  
42  
43 sensitive receptors that will lead to cumulative increases of less than 5 dBA. The  
44  
45 following table summarizes the existing sound levels found during the two surveys,  
46  
47 the expected performance of the plant based on the modeling analysis, and the



nominal cumulative increase in environmental sound level. When reviewing the table, bear in mind that sound levels add together logarithmically rather than arithmetically. For example, when the sound level of the plant alone is 10 dB or more below the existing ambient, plant noise adds nothing to the total and the pre-existing sound level remains the same.

**Table DMH-1 *Expected Cumulative Noise Levels at Surveyed Receptors***

<b>Location</b>	<b>Expected Plant Sound Level, dBA</b>	<b>Existing L90 Background Level, dBA</b>	<b>Expected New Cumulative Sound Level, L90, dBA</b>	<b>Expected Cumulative Increase Relative to Pre-existing L90 Background, dBA</b>
Rec. 7 Jackson Rd.	40	51	51	0
Rec. 10 Bay and Blaine Rds.	40	42	44	2
Rec. 11 Bay and Kickerville Rds.	39	40	43	3
Rec. 14 Kickerville and Brown Rds.	43	41	45	4

Location	Expected Plant Sound Level, dBA	Existing L90 Background Level, dBA	Expected New Cumulative Sound Level, L90, dBA	Expected Cumulative Increase Relative to Pre-existing L90 Background, dBA
8009 Comox Rd. Birch Bay Village	26	37	37	0
4825 Alderson Rd. Birch Bay	34	43	44	1
Arnie Rd.	34	35	38	3
8026 Birch Bay Dr. Birch Bay	30	43	43	0

In most cases, the new cumulative sound level is anticipated to be substantially below the 5 dBA design goal, particularly at the more distant receptor points in and around Birch Bay where noise from the cogeneration facility should be completely inaudible.

**Q. Have any noise attenuation measures been incorporated into the design of the facility in order to achieve the expected plant sound levels in the table?**

A. Yes. Quite a few individual plant components, such as the combustion turbines and steam turbine, are normally supplied with substantial noise containment enclosures

1 and silencers and these features have been considered in the noise model. Beyond  
2 these standard features, however, acoustical siding is currently planned for the entire  
3 steam turbine support structure below the operating deck to contain noise from this  
4 area of the plant. In addition, stack silencers will be added to quiet the stack  
5 discharges. As mentioned above, a number of other noise mitigation measures,  
6 primarily consisting of vent silencers and acoustical lagging, may be employed as  
7 appropriate to control transient noise during plant start-ups.  
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17 In general, the most effective noise attenuation mechanism is shear distance from the  
18 source to the receptor point. Largely because the project site is near the center of the  
19 very extensive BP refinery property, the distances from the project site to the nearest  
20 sensitive receptors are quite large compared to many other similar domestic plants I  
21 am familiar with. The nearest receptor is approximately 0.8 miles away and all others  
22 are 1 mile or more. Over distances of this magnitude, noise from a plant such as the  
23 proposed development will generally diminish to the point where the plant sound  
24 level is so low that it would not normally be noticeable or considered an adverse  
25 impact even if there were no background noise of any kind to mask facility noise.  
26 For example, the expected plant sound levels of 40 dBA or less in the summary table  
27 above are comparable to or even quieter than a typical library or conference room.  
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41 **Q. Let's talk about low frequency noise. Does low frequency noise pose a potential**  
42 **problem from the BP project?**  
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44 **A.** No. Problematic low frequency noise; i.e. airborne low frequency noise that may  
45 induce windows to rattle or might be felt rather than heard inside enclosed spaces, is a  
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1 very common occurrence at simple cycle combustion turbine facilities but is an  
2 extremely rare phenomenon at combined cycle plants. If the proposed facility were a  
3 simple cycle installation (without heat recovery steam generators (HRSG's) and the  
4 entire steam side power cycle) the control of low frequency noise would be the  
5 primary and almost sole focus of the acoustical design. With a combined cycle plant;  
6 however, the large HRSG's connected to the combustion turbine exhausts act  
7 (inadvertently) as very effective mufflers, or, more precisely, as expansion chamber  
8 silencers, with respect to long wavelength, low frequency noise.  
9

10 According to Appendix B of ANSI B133.8-1989 *Gas Turbine Installation Sound*  
11 *Emissions* (Exhibit 24.5 (DMH-5)), the threshold for the onset of perceptible  
12 vibrations in frame structures from low frequency noise is a sound level of  
13 approximately 75 to 80 dBC (as opposed to A-weighted sound levels, C-weighted  
14 levels are commonly used when low frequency noise is of primary interest).  
15 Coincidentally, I had an opportunity very recently to measure a 2x1 (2 combustion  
16 turbines and 1 steam turbine) combined cycle plant operating at full load that was  
17 nearly identical to the future 3x1 Cherry Point facility. This comparable facility also  
18 had GE 7FA combustion turbines as prime movers and a wet cooling tower - but no  
19 special noise abatement upgrades of any kind. At a distance of 200 m [656 ft.] from  
20 the side of the nearest powertrain, I measured a total C-weighted sound level of 73  
21 dBC. This measurement shows that, even at a relatively short distance, low  
22 frequency noise levels from a plant of this type are below the ANSI threshold. Of  
23 course, at 4200 ft., the distance to the nearest sensitive receptor at Cherry Point, a C-  
24 weighted sound level on the order to 10 to 15 dBC lower can be expected.  
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3 Having said that, low frequency noise problems from HRSG's are not impossible and  
4 internal standing wave or tube bundle resonances can occur on very rare occasions.  
5  
6 When this does happen, it is never allowed to persist out of concerns for weld fatigue,  
7  
8 if nothing else, and the problem is quickly resolved. I can think of only two projects  
9  
10 out of the hundreds my firm has handled in the past where we have been called on to  
11  
12 diagnose and develop a solution for such a problem.  
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16  
17 **Q. Speaking of retrofit solutions, if a noise problem anywhere in the plant were to**  
18  
19 **become apparent after the facility is operational, could anything be done to**  
20  
21 **eliminate the problem?**

22  
23 A. Most plants meet their design goals as expected so this issue does not frequently  
24  
25 arise. However, occasionally there will occur some, usually never-before-seen,  
26  
27 acoustical deficiency when a new plant is initially operated. Of course, the  
28  
29 immediate course of action is to identify the cause of the problem and devise a  
30  
31 practical remedy. The nature of the solution depends on the specific problem and its  
32  
33 relative severity but I cannot recall any case, involving a combined cycle facility with  
34  
35 a wet cooling tower like the proposed Cherry Point plant, where a serious noise  
36  
37 problem could not be resolved.  
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41 In the modeling analysis for Cherry Point, several possible retrofit noise controls,  
42  
43 such as generator barrier walls and blower enclosures, were identified as being  
44  
45 candidates for potential back-fit; i.e. these improvements could be implemented as  
46  
47 effective fallback measures if facility noise exceeded expectations for any reason. I

1 have recommended to the project that provisions (space, clearances, foundations, etc.)  
2  
3 be made to install these improvements in the unlikely event they are needed.  
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7 **Conclusion**  
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9 **Q. Can you summarize your conclusions about the sound emissions from the BP**  
10 **Cogeneration project?**  
11

12 **A.** I have reviewed the proposed design of the BP Cherry Point power project, inspected  
13  
14 the site environs, modeled the expected noise emissions of the plant at the nearest  
15  
16 sensitive receptors, and recommended certain improvements to limit the facility's  
17  
18 noise emissions. Based on this analysis and experience with many other similar  
19  
20 plants, I am confident that the facility will comply with the Washington State and  
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22 Whatcom County daytime noise limit of 60 dBA and nighttime noise limit of 50 dBA  
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24 at residentially zoned properties as well as the industrial receiving zone limit of 70  
25  
26 dBA. Moreover, based on the existing environmental sound levels measured in the  
27  
28 recent surveys, I believe that noise from the project during full load operation will be  
29  
30 largely or completely imperceptible at all of the residential areas in the vicinity of the  
31  
32 site, especially in the community of Birch Bay. In the unlikely event that a noise  
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34 problem becomes evident once the plant is operational, there is no reason to believe it  
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36 could not be mitigated.  
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39 **END OF TESTIMONY**  
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